

Research Article

The Influence of CAR and SIZE on Intermediation through Digital Transformation Efficiency in State-Owned Banks and Regional Development Banks for the 2010-2024 Period

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Abstract: This study analyzes the effect of Capital Adequacy Ratio (CAR), bank size (SIZE), and digital transformation efficiency on banking intermediation, as well as the role of digital efficiency as a mediator in state-owned banks and regional development banks in Indonesia. Annual financial report data from 2010 to 2024 were analyzed using panel data re-gression (CEM) and Sobel's test. Intermediation is measured by LDR, while digital efficiency is measured by the ratio of IT costs to total operating costs. The results show that in regional banks, CAR and SIZE have a significant positive effect on intermediation, and digital efficiency mediates this relationship ($z = 2.07$; $p = 0.038$; $z = 2.42$; $p = 0.015$). Meanwhile, in state-owned banks, digital efficiency only has a direct effect on intermediation without a mediating effect, and NPL is not a distinguishing factor in the intermediation mechanism. These findings emphasize the importance of efficient digital capabilities to drive intermediation, especially in regional development banks.

Keywords: Digital Transformation Efficiency; Banking Intermediation; Capital Adequacy Ratio (CAR); Bank Size; Operational Efficiency.

1. Introduction

The development of digitalization in the Indonesian banking sector has grown very fast in the last decade. The national digital economy transaction value reached USD 90 billion in 2024 (Neraca, 2025). Electronic money transactions reached Rp2,503.96 trillion with growth of 34.62% (Yonatan, 2025). This shows that digital services have become the backbone of the modern economy (Neraca, 2025). Customers now prefer financial services that are fast, simple, and accessible anytime through digital channels. This situation forces banks to transform not only their services but also their governance and operational efficiency. Digital banking transactions in Indonesia have increased significantly from 2018 to 2023 (Databoks, 2023). Therefore, digital transformation is no longer optional but a strategic necessity for banks to maintain their intermediation role in the economy.

Many studies explain that digital transformation improves efficiency and competitiveness in banking. According to Fauziah et al. (2025), state-owned banks (Bank BUMN) were able to reduce their BOPO ratio to 64.20% through better cost control supported by digital systems. Hartono et al. (2025) found that the COVID-19 pandemic accelerated digital adoption in Indonesian banks and made digitalization a strategic need to maintain intermediation. In Islamic banking, Bengi Asrah et al. (2023) showed that electronic business implementation improved efficiency and service expansion. Putri and Yafiz (2023) explained that Capital Adequacy Ratio (CAR) and bank size (SIZE) positively influence intermediation performance because well-capitalized and large banks are more ready to invest in technology and manage risk. Kayani and Hakimian (2023) also stated that large banks benefit from economies of scale, technology access, and stronger investment capacity. However, OJK (2024) reported that many Regional Development Banks (BPD) still face limitations in capital, infrastructure, and human resources. Kholis (2025) added that data security and regulatory readiness are also important challenges. If these issues are not addressed, digital

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transformation may not optimally improve Loan to Deposit Ratio (LDR) and overall intermediation performance.

This study focuses on Bank BUMN and Regional Development Banks (BPD) in Indonesia. In general, Bank BUMN have very large assets, strong capital, high operational complexity, and more advanced digital banking systems (Paminto, 2024). In contrast, BPD operate mainly at the regional level with medium asset scale and more varied efficiency levels (Paminto, 2024). Although both groups play an important role in supporting national and regional economic growth, they have different characteristics in terms of capital strength, asset scale, and digital readiness. These differences make Bank BUMN and BPD relevant and interesting objects to compare in analyzing how CAR and SIZE influence in-termediation through digital transformation efficiency during 2010–2024.

Despite many studies on digital banking, there is still a research gap. Most previous studies focus on the direct effect of digital transformation on efficiency or profitability. Limited research examines how internal bank factors, such as CAR and SIZE, support digital transformation efficiency and then influence intermediation performance. According to Dynamic Capabilities Theory (Teece et al., 1997), organizations need adaptive capabilities to respond to environmental change. The Technology–Organization–Environment framework (Tornatzky & Fleischer, 1990) explains that technological readiness, organizational support such as capital and size, and external pressure determine technology adoption success. Financial Intermediation Theory (Freixas & Rochet, 2010) emphasizes that banks improve intermediation when they manage costs and risks efficiently. However, empirical evidence linking CAR and SIZE to intermediation through digital transformation efficiency, especially comparing Bank BUMN and BPD, is still limited and inconsistent.

Based on this gap, this research aims to examine how Capital Adequacy Ratio (CAR) and bank size (SIZE) affect intermediation directly and indirectly through digital transformation efficiency in Bank BUMN and BPD in Indonesia during 2010–2024. This study is expected to contribute to academic knowledge by integrating Dynamic Capabilities Theory (Teece et al., 1997), TOE framework (Tornatzky & Fleischer, 1990), and Financial Intermediation Theory (Freixas & Rochet, 2010) in explaining digital banking transformation. Practically, the results can help bank management and regulators understand the importance of capital strength and asset scale in supporting effective digital transformation. This study seeks to answer five main objectives which are (1) to analyze the effect of CAR on intermediation, (2) to analyze the effect of SIZE on intermediation, (3) to analyze the effect of digital transformation on intermediation, (4) to test the mediating role of digital transformation in the relationship between CAR and intermediation, and (5) to test the mediating role of digital transformation in the relationship between SIZE and intermediation.

2. Literature Review

Dynamic Capabilities Theory

Dynamic Capabilities Theory was introduced by Teece et al. (1997). This theory explains how firms can maintain competitive advantage in a fast-changing environment. According to Teece et al. (1997), competitive advantage depends on the firm's ability to integrate, build, and reconfigure internal and external resources. Later, Teece (2009) explained three main processes of dynamic capabilities: sensing opportunities and threats, seizing opportunities through innovation, and reconfiguring resources to adapt to change. In the banking sector, this theory is relevant because banks face rapid technological change and strict regulation. Banks with strong internal resources, such as high Capital Adequacy Ratio (CAR) and large size (SIZE), have better ability to adapt and invest in digital systems. Through digital transformation, banks can improve efficiency and strengthen their intermediation function. Therefore, Dynamic Capabilities Theory (Teece et al., 1997; Teece, 2009) supports the idea that capital strength and bank size help banks use digital transformation effectively to improve performance.

Technology–Organization–Environment (TOE) Framework

The Technology–Organization–Environment (TOE) Framework was introduced by Tornatzky and Fleischer (1990). This framework explains factors that influence technology adoption at the organizational level. TOE divides these factors into three contexts: technology context (availability and maturity of technology), organization context (structure, resources, and management support), and environment context (competition, regulation, and

market pressure). Suradi (2025) found that the TOE framework is effective to analyze digital transformation success in the public sector because it explains how technology readiness, organizational characteristics, and environmental pressure influence digital implementation. In banking, digital transformation depends on technological infrastructure, organizational support such as CAR and SIZE, and environmental factors like regulation and competition. The TOE framework (Tornatzky & Fleischer, 1990; Suradi, 2025) helps explain how internal strength and external pressure influence digital transformation success in banks.

Financial Intermediation Theory

Financial Intermediation Theory explains the role of banks as intermediaries between surplus units and deficit units in the economy. Rose and Hudgins (2010) stated that banks collect funds from parties with excess liquidity and distribute them to parties who need financing for consumption, investment, and business activities. This intermediation process supports economic stability and growth. The effectiveness of intermediation depends on risk management, operational efficiency, and financial stability (Rose & Hudgins, 2010). Banks with strong capital and large asset scale have better capacity to absorb risk and expand lending. Digital transformation can also improve efficiency in fund collection and loan distribution. Therefore, Financial Intermediation Theory (Rose & Hudgins, 2010) supports the relationship between CAR, SIZE, digital transformation, and intermediation performance.

Banking Efficiency

Banking efficiency reflects the ability of banks to maximize output, such as loans and interest income, while minimizing input, such as operational costs and assets, without reducing service quality (Burhanuddin et al., 2022). Efficient banks can allocate resources better and improve their intermediation role. Efficiency can be measured using financial ratios or frontier methods. Kumar and Singh (2014) explained that Data Envelopment Analysis (DEA) is widely used to compare efficiency among banks. Akbary et al. (2025) also stated that financial indicators such as Loan to Deposit Ratio (LDR) can be used to reflect intermediation efficiency. Therefore, banking efficiency is closely related to cost control, risk management, and optimal fund allocation (Burhanuddin et al., 2022; Kumar & Singh, 2014; Akbary et al., 2025).

Loan to Deposit Ratio (LDR)

Loan to Deposit Ratio (LDR) measures the bank's ability to distribute third-party funds into loans. LDR reflects the effectiveness of the intermediation function. A balanced LDR shows optimal fund utilization, while a low LDR indicates idle funds and a very high LDR increases liquidity risk (Yonatan & Riadi, 2022). Akbary et al. (2025) explained that digitalization can speed up fund collection and loan distribution, although the effect of LDR on efficiency is not always significant. LDR is an important indicator in assessing how well banks perform their intermediation role. LDR becomes a key measure to evaluate whether digital transformation and internal strength improve intermediation effectiveness (Yonatan & Riadi, 2022; Akbary et al., 2025).

Digital Transformation

Digital transformation refers to major changes in business processes, organizational structure, and customer relationships through digital technology (Tymoine, 2016). In banking, this transformation appears in the shift from branch-based services to integrated digital services (Cobos Gutierrez, 2024). Plekhanov et al. (2023) stated that digital transformation includes technology strategy, organizational flexibility, and digital skills improvement. Examples include credit automation, big data for customer segmentation, artificial intelligence for risk prediction, and electronic Know Your Customer (e-KYC) for onboarding (Ranjan, 2024). Research shows that comprehensive digital transformation improves efficiency and competitiveness (Akbary et al., 2025; Hommel & Bican, 2020). Sugihyanto and Arsjah (2023) added that digital effectiveness can be measured through operational cost control, such as IT OpEx Ratio. Furthermore, digitalization is not a short-term project but a long-term organizational change toward adaptability and sustainability (Diener & Špaček, 2021). Digital transformation plays a key role in connecting internal bank

strength, such as CAR and SIZE, with improved efficiency and stronger intermediation performance (Tymoigne, 2016; Hommel & Bican, 2020; Akbary et al., 2025).

Research Framework

This study develops a theoretical framework and conceptual framework to analyze the impact of digital transformation on banking intermediation, particularly in state-owned banks and regional development banks in Indonesia during the period 2010–2024.

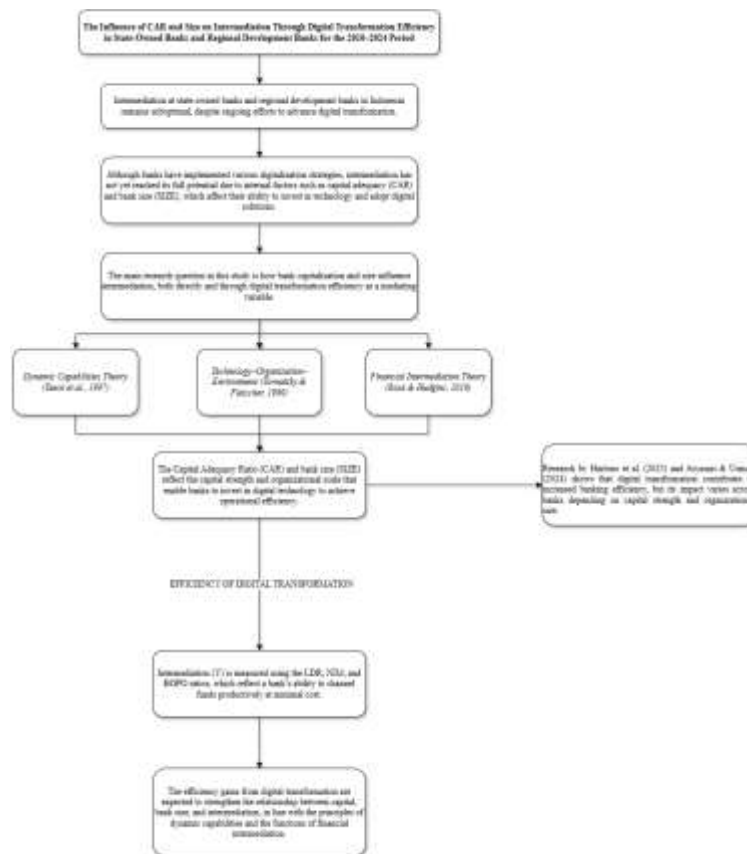


Figure 1. Research Framework.

Source: Author (2025)

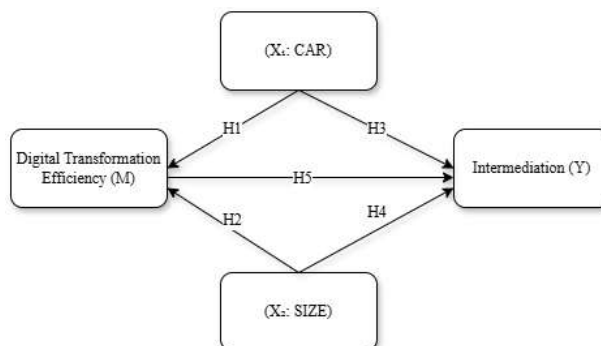


Figure 2. Research Framework

Source: Author (2025)

Hypothesis Development

Based on Dynamic Capabilities Theory (Teece et al., 1997), a bank’s competitive advantage depends on its ability to adapt and use its internal resources effectively in a changing environment. Capital Adequacy Ratio (CAR) and bank size (SIZE) reflect internal strength

that allows banks to invest in innovation and technology. The Technology–Organization–Environment (TOE) Framework (Tornatzky & Fleischer, 1990) explains that digital transformation depends on technological readiness, organizational capacity, and environmental pressure. In addition, Financial Intermediation Theory (Rose & Hudgins, 2010) states that bank performance in intermediation depends on financial stability, efficiency, and risk management. Previous studies show that digitalization, capital strength, and bank size positively influence intermediation performance (Hartono et al., 2025; Putri & Yafiz, 2023). Based on these theories and findings, the following hypotheses are developed.

According to Financial Intermediation Theory (Rose & Hudgins, 2010), the ability of banks to perform intermediation depends on their capital strength. CAR shows the bank's ability to absorb risk and maintain stability. A higher CAR means the bank has stronger financial resilience and more confidence to expand lending activities. Banks with strong capital can manage credit risk better and support higher loan distribution. Putri and Yafiz (2023) found that CAR has a positive effect on intermediation performance because strong capital improves bank stability and lending capacity. This finding is also supported by recent evidence from Hartono et al. (2025), which shows that financial strength is important to maintain banking performance in the digital era. Therefore, higher CAR is expected to increase banking intermediation.

H1: The Effect of Capital Adequacy Ratio (CAR) on Intermediation.

Bank size (SIZE) reflects the total assets owned by a bank and shows its operational and financial capacity. Based on Dynamic Capabilities Theory (Teece et al., 1997), organizations with larger resources have better ability to develop and reconfigure assets to create value. Large banks usually have stronger access to capital, technology, and skilled human resources. Kayani and Hakimian (2023) found that bank size positively affects intermediation because large banks benefit from economies of scale and better operational capacity. Putri and Yafiz (2023) also showed that larger banks tend to have better intermediation performance due to stronger financial and technological readiness. Therefore, a larger bank size is expected to improve the effectiveness of intermediation.

H2: Bank size (SIZE) has a positive effect on banking intermediation in Indonesia.

Digital transformation improves efficiency through process automation, faster services, and wider customer access. Based on the TOE Framework (Tornatzky & Fleischer, 1990), successful technology adoption depends on organizational readiness and environmental support. Digital banking systems help reduce operational costs and speed up fund collection and loan distribution. Hartono et al. (2025) found that digitalization strengthened banking efficiency and intermediation performance in Indonesia, especially after the COVID-19 pandemic. Bengi Asrah et al. (2023) also showed that digital implementation improved service expansion and competitiveness. Therefore, higher digital transformation is expected to increase banking intermediation.

H3: Digital transformation has a positive effect on banking intermediation in Indonesia.

Banks with strong capital have more ability to invest in digital infrastructure and innovation. According to Dynamic Capabilities Theory (Teece et al., 1997), internal resources such as capital can be reconfigured into new digital capabilities. Digital transformation becomes a bridge that connects financial strength with operational efficiency and better intermediation. Akbary et al. (2025) found that digitalization strengthens the relationship between internal organizational strength and intermediation through productivity improvement. Hartono et al. (2025) also emphasized that digital investment supports sustainable banking performance. Therefore, CAR is expected to influence intermediation indirectly through digital transformation.

H4: Digital transformation mediates the effect of Capital Adequacy Ratio (CAR) on banking intermediation in Indonesia.

Large banks have better organizational readiness to adopt digital innovation. Based on the TOE Framework (Tornatzky & Fleischer, 1990), organizational context, including resource capacity, is an important factor in technology adoption. Banks with larger assets can invest more in digital systems such as mobile banking, digital lending, and electronic payment platforms. Sari et al. (2025) found that digital investment improves banking performance and

competitiveness. Bengi Asrah et al. (2023) also confirmed that technology adoption increases efficiency and service quality. This means larger banks are more able to use digital transformation to improve intermediation performance.

H5: Digital transformation mediates the effect of bank size (SIZE) on banking intermediation in Indonesia.

3. Method

This study uses a quantitative explanatory research design, which aims to test causal relationships between variables through statistical hypothesis testing (Sofya et al., 2024). The research was conducted in Indonesia and focuses on State-Owned Banks (Bank BUMN) and Regional Development Banks (BPD) under the supervision of the Financial Services Authority (OJK). The observation period covers 2010–2024 to capture changes in capital strength, bank size, digital transformation, and intermediation performance before and after major economic events. The population includes all Bank BUMN and BPD registered at OJK. The sampling technique uses census sampling, meaning all population members that meet the criteria are included. The sample consists of ten banks, five Bank BUMN (Bank Mandiri, BRI, BNI, BTN, and Bank Syariah Indonesia/BSI, with pre-2021 Islamic bank data reconstructed from the merger entities) and five listed BPD (Bank BJB, Bank Jatim, Bank Banten, Bank Aceh Syariah, and Bank BPD Bali), resulting in 150 bank-year observations (10 banks \times 15 years). The data are secondary data collected from annual reports, financial statements, OJK statistics, Bank Indonesia publications, and Indonesia Stock Exchange reports.

Data collection uses documentation techniques to ensure accuracy and completeness. The independent variables are Capital Adequacy Ratio (CAR), measured as capital divided by risk-weighted assets (Ismaulina et al., 2020), and bank size (SIZE), measured as the proportion of total bank assets to total national banking industry assets (modified from Januwito, 2022). The dependent variable is banking intermediation, measured using a composite index of Loan to Deposit Ratio (LDR), Net Interest Margin (NIM), and BOPO (with BOPO reversed as $100 - \text{BOPO}$) (Autantika & Surjandari, 2024). The mediating variable is digital transformation efficiency, proxied by the IT OpEx Ratio (OJK, 2021; Ak-bary et al., 2025). The control variable is Non-Performing Loan (NPL) ratio (Gujarati, 2024).

Data analysis uses panel data regression because it combines time-series and cross-section advantages (Gujarati & Porter, 2020). The estimation is conducted using EViews 13 and includes descriptive statistics, classical assumption tests (normality, multicollinearity, heteroskedasticity, and autocorrelation) (Ghozali, 2018; Widarjono, 2023; Nachrowi & Usman, 2006), and panel model selection tests (Chow, Hausman, and Lagrange Multiplier tests) (Baltagi, 2021; Gujarati & Porter, 2020). Hypothesis testing uses F-test, t-test, and coefficient of determination (R^2) (Ghozali, 2018). Mediation analysis applies the Sobel test to examine indirect effects (Abu-Bader & Jones, 2021). The regression models are estimated separately for Bank BUMN and BPD to compare differences between groups and to understand how institutional characteristics influence intermediation performance in the digital transformation era, supported by Dynamic Capabilities Theory (Teece et al., 1997), the TOE Framework (Tornatzky & Fleischer, 1990), and Financial Intermediation Theory (Rose & Hudgins, 2010).

4. Results and Discussion

Data Analysis Results

Before testing the hypotheses, this study first presents descriptive statistics to show the general characteristics of the data. This analysis provides information about the average value and data variation of each research variable. It also helps to compare the conditions between State-Owned Banks and Regional Development Banks during the observation period. The complete results are presented in Table 1 below.

Table 1. Descriptive Statistics.

Variabel	BPD Mean	BUMN Mean	BPD Std.Dev	BUMN Std.Dev
CAR	27.05	20.72	9.92	4.68

SIZE	6.75	5.70	3.12	3.01
Digital	55.53	39.06	24.51	9.40
NPL	2.74	2.50	2.96	1.88

Source: Primary Data Processing (2025).

The descriptive statistics show that the average CAR of BPD banks is 27.05, indicating that their capital level is relatively strong during the research period. The average value of Size is 6.75, which suggests differences in business scale among BPD banks. Digital Transformation Efficiency has an average of 55.53 with a high standard deviation, meaning there are significant differences in digital capability between banks. The average NPL is 2.74, which is still within a safe level in the banking industry.

Meanwhile, the average intermediation value is 82.80, showing that BPD banks play an active role in channelling funds. The high variation in digital efficiency and intermediation indicates that bank performance is influenced by differences in internal strategy and capacity among BPD banks.

Table 2. Classical Assumption Test Results.

Test	Result	Conclusion
Normality	Prob > 0.05	Normal
Multicollinearity	VIF < 10	No multicollinearity
Heteroskedasticity	Prob > 0.05	No heteroskedasticity
Autocorrelation	Prob > 0.05	No autocorrelation

Source: Primary Data Processing (2025).

The classical assumption test results show that the regression model meets all the required statistical assumptions. The normality test indicates that the data are normally distributed, meaning the residuals follow a proper distribution pattern. The multicollinearity test shows that there is no strong correlation among the independent variables, so each variable can explain the dependent variable clearly without overlapping effects. The heteroskedasticity test indicates that the variance of the residuals is stable, and the autocorrelation test shows that there is no correlation between error terms across observations. These results confirm that the regression model is statistically reliable.

Therefore, the model is appropriate and valid for further hypothesis testing and interpretation. This also means that the estimated coefficients can be interpreted with confidence. Overall, the model provides a strong basis for drawing conclusions in this study.

Table 3. Panel Model Selection.

Test	Result	Selected Model
Chow Test	Significant	CEM
Hausman Test	Not Significant	CEM

Source: Primary Data Processing (2025).

Based on the Chow and Hausman tests, the Common Effect Model (CEM) is selected as the most appropriate model for this study. The test results indicate that the CEM provides a better fit compared to the Fixed Effect Model and Random Effect Model for the data used in this research. This means there is no strong evidence that individual or time-specific effects significantly influence the regression model.

Table 4. Regression Results.

Variable	Coefficient	Probability	Conclusion
CAR	+	0.000	Supported
SIZE	+	0.000	Supported
Digital	+	0.000	Supported
NPL	-	0.048	Significant

Source: Primary Data Processing (2025).

The regression results show that Capital Adequacy Ratio (CAR), bank size (SIZE), and Digital Transformation have a positive and significant effect on banking intermediation. This means that stronger capital, larger asset size, and better digital efficiency help banks improve

their ability to collect and distribute funds. Adequate capital allows banks to manage risk more confidently, while larger size provides more resources and wider operational capacity. In addition, digital transformation improves service speed, operational efficiency, and risk monitoring, which supports better lending performance. On the other hand, Non-Performing Loans (NPL) have a negative and significant effect on intermediation. This means that higher credit risk reduces the bank’s ability to expand lending activities. When bad loans increase, banks tend to be more cautious and limit credit distribution to maintain stability. Overall, the results indicate that financial strength and digital capability strengthen banking intermediation, while high credit risk weakens it.

Table 5. F-Test and Coefficient of Determination Results.

Bank	F-Statistic	Probability	R ²	Conclusion
BUMN	24.79664	0.000	0.5863	Model is significant and explains 58.63% of Intermediation
BPD	45.63219	0.000	0.7228	Model is significant and explains 72.28% of Intermediation

Source: Primary Data Processing (2025).

Based on Table 5, the F-test results show that the regression models for both BUMN and BPD banks are statistically significant. This is indicated by the probability value of 0.000 for both groups, which is below 0.05. It means that CAR, Size, Digital Transformation Efficiency, and NPL simultaneously have a significant effect on banking intermediation. The R-square value for BUMN banks is 0.5863, which means that 58.63% of the variation in intermediation can be explained by the independent variables in the model. For BPD banks, the R-square value is 0.7228, meaning that 72.28% of the variation in intermediation is explained by the model. This shows that the model has stronger explanatory power for BPD compared to BUMN. However, the R-square value for BUMN is still above 0.50, indicating that the model is relatively good, although there are other factors outside this study that may also influence intermediation.

Table 6. F-Test and Coefficient of Determination Results.

Bank	Mediation Path	Z-value	p-value	Conclusion
BUMN	X1 → M → Y	1.58	0.113	Not mediated
BUMN	X2 → M → Y	-0.89	0.370	Not mediated
BPD	X1 → M → Y	2.07	0.038	Significant mediation
BPD	X2 → M → Y	2.42	0.015	Significant mediation

Source: Primary Data Processing (2025).

Based on Table 6, the Sobel test results show that for BUMN banks, Digital Transformation Efficiency does not significantly mediate the relationship between CAR and Intermediation, nor between Size and Intermediation. This is shown by the p-values greater than 0.05. Therefore, digital transformation does not act as a mediating variable in BUMN banks. For BPD banks, Digital Transformation Efficiency significantly mediates the relationship between CAR and Intermediation, as well as between Size and Intermediation. The p-values are below 0.05, indicating significant mediation effects. This means that in BPD banks, digital transformation plays an important role in strengthening the effect of capital and bank size on intermediation performance.

Hypothesis Testing

This section presents the results of hypothesis testing to examine the relationships between the research variables. The analysis aims to determine whether each hypothesis is supported or not based on the statistical results. The findings are summarized in the following table, followed by a brief explanation of each hypothesis.

Table 7. Summary of Hypothesis Testing Results.

Hypothesis	Statement	BUMN Result	BPD Result	Conclusion
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H1	CAR → Intermediation	Not Significant	Significant	Supported only for BPD
H2	Size → Intermediation	Not Significant	Significant	Supported only for BPD
H3	Digital → Intermediation	Significant	Significant	Supported
H4	CAR → Digital → Intermediation	Not Mediated	Mediated	Supported only for BPD
H5	Size → Digital → Intermediation	Not Mediated	Mediated	Supported only for BPD

Source: Primary Data Processing (2025).

Based on the hypothesis testing results, the effects of CAR and bank size on intermediation differ between BUMN and BPD banks. CAR has a significant positive effect on intermediation only in BPD banks, while in BUMN banks the effect is not significant. This means capital strength plays a more important role in supporting lending activities in BPD compared to BUMN. Similarly, bank size significantly influences intermediation in BPD banks but not in BUMN banks. This indicates that larger size helps BPD banks expand their lending activities, while in BUMN banks size differences do not strongly affect intermediation performance.

Digital transformation shows a positive and significant effect on intermediation in both BUMN and BPD banks. This means digital efficiency consistently improves banking performance in collecting and distributing funds. For the mediation effect, digital transformation significantly mediates the relationship between CAR and intermediation, as well as between size and intermediation, only in BPD banks. In BUMN banks, digital transformation does not act as a mediating variable. These results indicate that the role of capital and size depends on how effectively banks convert their resources into digital capability, especially in BPD banks.

Relationship between Capital Adequacy Ratio (CAR) and Intermediation

The results show that the effect of Capital Adequacy Ratio (CAR) on intermediation is different between BUMN banks and BPD banks. In BPD, CAR has a positive effect on intermediation, but in BUMN banks the effect is not significant. This means capital strength does not work in the same way in every bank group. According to Financial Intermediation Theory, capital is important because it helps banks absorb risk and continue lending activities (Rose & Hudgins, 2010). Capital works as a safety buffer that protects banks from credit risk and economic uncertainty. In theory, stronger capital should support higher lending activity. However, this study shows that the relationship is not always the same in different institutional contexts. In BPD banks, CAR plays a more direct role in supporting intermediation. BPD usually operate at a regional level and face more fluctuating local economic conditions. Because of that, management decisions in BPD are more sensitive to capital conditions. When capital is strong, BPD feel more confident to expand credit distribution. This finding supports the study of Putri dan Yafiz (2023), who state that in smaller-scale banks, capital directly encourages credit expansion and maintains stability.

Therefore, in BPD, CAR becomes a strategic resource that directly affects intermediation performance. CAR does not significantly affect intermediation in BUMN banks. BUMN banks have larger organizational structures, diversified portfolios, and more mature risk management systems. In this situation, capital is already embedded in a stable system. Variations in CAR within a safe range do not strongly influence lending decisions. Intermediation in BUMN banks is more influenced by operational efficiency and long-term business strategy. This condition supports Dynamic Capabilities Theory, which explains that internal resources only affect performance when configured properly within the organization (Teece et al., 1997).

Relationship between Bank Size (SIZE) and Intermediation

The study also finds different results for the effect of bank size on intermediation. In BPD banks, size positively influences intermediation. However, in BUMN banks, size does not significantly affect intermediation. This means that size does not always determine lending performance in all banks. According to Financial Intermediation Theory, larger banks usually have better ability to collect funds, diversify risk, and achieve cost efficiency (Rose &

Hudgins, 2010). In theory, larger asset size should increase lending capacity. Dynamic Capabilities Theory also explains that organizational size can become an advantage if it is converted into effective operational capability (Teece et al., 1997). In BPD banks, larger size gives more flexibility to expand lending activities. Bigger asset capacity allows BPD to allocate more resources for credit distribution. Therefore, size becomes an important factor that strengthens intermediation. This supports the Technology–Organization–Environment (TOE) Framework, which states that organizational factors influence performance when managed effectively (Tornatzky & Fleischer, 1990).

In BPD, size still creates differences in lending capability. However, in BUMN banks, size does not significantly affect intermediation. This happens because asset scale among BUMN banks is already large and relatively stable. Differences in size do not create meaningful differences in lending performance. Intermediation is more influenced by internal policies and standardized risk management systems. This finding shows a difference from some previous studies that assume larger size always improves performance. This study proves that size only matters when it still creates operational differences among banks.

Relationship between Digital Transformation and Intermediation

The results show that digital transformation positively affects intermediation in both BUMN and BPD banks. This finding is consistent with the TOE Framework, which explains that technology improves organizational performance when supported by internal readiness and environment (Tornatzky & Fleischer, 1990). Digital systems make banking processes faster, more accurate, and more integrated. This strengthens the intermediation function explained in Financial Intermediation Theory (Rose & Hudgins, 2010). Digital transformation improves operational efficiency and risk monitoring. It helps automate services, speed up credit processing, and expand financial access. This condition allows banks to increase output without increasing input significantly. Burhanuddin et al. (2022) explain that digital efficiency supports better banking performance.

In addition, digital monitoring helps maintain credit quality and control risk. This finding supports Hartono et al. (2025), who show that banking digitalization improves fund collection and distribution efficiency. It also supports Akbary et al. (2025), who explain that digital transformation reduces operational costs and strengthens credit performance. Unlike CAR and size, digital transformation consistently improves intermediation in both bank groups. This shows that digital capability is a universal strategic factor. According to Dynamic Capabilities Theory, digital transformation represents the ability to reconfigure resources to adapt to environmental change (Teece et al., 1997). Therefore, digital transformation becomes a key driver of banking intermediation.

Relationship between CAR and Intermediation through Digital Transformation

This study finds that digital transformation mediates the effect of CAR on intermediation only in BPD banks. In BPD, strong capital supports digital investment, and digital capability strengthens intermediation. This supports Dynamic Capabilities Theory, which states that resources must be transformed into operational capability to improve performance (Teece et al., 1997; Teece, 2009). Capital alone is not enough; it must be converted into digital systems that improve efficiency. This finding is also consistent with the TOE Framework, especially the organizational dimension, which emphasizes internal readiness such as capital in supporting technology adoption (Tornatzky & Fleischer, 1990).

Akbary et al. (2025) and Hartono et al. (2025) explain that digitalization improves performance when supported by internal capacity. In BPD, capital becomes effective because it supports digital strengthening. However, this mediation does not occur in BUMN banks. Although capital is strong, it does not significantly improve intermediation through digital transformation. This condition aligns with Financial Intermediation Theory (Rose & Hudgins, 2010), where intermediation is already supported by stable risk management systems. Silalahi dan Anggraeni (2020) also explain that CAR often functions as a prudential stability instrument rather than a direct expansion driver.

Relationship between SIZE and Intermediation through Digital Transformation

The results show that digital transformation mediates the relationship between size and intermediation in BPD but not in BUMN banks. In BPD, larger size allows more investment in digital infrastructure. This supports Dynamic Capabilities Theory and TOE Framework,

which explain that resources must be integrated effectively to influence performance (Teece et al., 1997; Tornatzky & Fleischer, 1990). The rapid growth of Indonesia's digital economy also strengthens this argument. Yonatan (2025) explains that electronic transaction value continues to grow significantly. Neraca (2025) also states that Indonesia's digital economy is expanding rapidly. In this environment, BPD that can convert size into digital investment gain better efficiency and stronger intermediation.

This finding supports Kayani dan Hakimian (2023), who show that size improves intermediation when connected with digital investment. However, in BUMN banks, digital transformation does not mediate the effect of size. BUMN banks already have large assets and high digital readiness. Differences in size no longer create meaningful differences in lending performance. Bengi Asrah et al. (2023) and Hartono et al. (2025) explain that digitalization strengthens performance only when there is still room for efficiency improvement. Akbary et al. (2025) also state that cost reduction does not always lead to higher intermediation if the structure is already stable. Therefore, this study confirms that digital mediation of size is contextual and more relevant for BPD banks.

5. Conclusion and Suggestion

Conclusion

Based on the discussion results, it can be concluded that the effects of Capital Adequacy Ratio (CAR), bank size (SIZE), and digital transformation on banking intermediation are contextual between BUMN banks and BPD banks. The regression results show that CAR and bank size have a positive and significant effect on intermediation in BPD banks. However, in BUMN banks, these two variables do not have a direct significant effect. This finding indicates that in banks that are still sensitive to internal capacity changes, capital strength and relative size still play an important role in supporting intermediation. In contrast, in BUMN banks that already have more stable operational structures and risk management systems, differences in CAR and size are no longer the main factors in improving intermediation.

Digital transformation has a positive and significant effect on intermediation in both BUMN and BPD banks. This means digital transformation directly improves operational efficiency, speeds up fund collection and credit distribution, and supports better credit risk management. Through digitalization, banks can improve their business processes without depending only on larger assets or stronger capital. Therefore, digital transformation can be seen as a strategic factor that consistently strengthens the intermediation function in different types of banks.

In addition, the mediation test shows that digital transformation mediates the effect of CAR and bank size on intermediation in BPD banks, but not in BUMN banks. This means that in BPD, capital and size become more effective when they are converted into digital capability. In BUMN banks, the mediation effect is not significant because intermediation is already supported by stable operational and risk management systems. Overall, this study confirms that the roles of CAR, bank size, and digital transformation in improving banking intermediation depend on organizational context and institutional characteristics of each bank.

Suggestion

For future researchers, it is strongly recommended to develop a more comprehensive measurement of digital transformation. Future studies should include qualitative indicators such as digital culture, employee digital skills, IT governance quality, leadership support, and digital innovation strategy. Using survey data or mixed methods (quantitative and qualitative approaches) would help provide deeper understanding of digital capability in banks. Future research is also encouraged to expand the sample to include other types of banks, such as private national banks, Islamic banks, and foreign banks operating in Indonesia. Comparing different bank categories may provide broader insight into how organizational characteristics influence intermediation performance.

In addition, future studies may examine other moderating or mediating variables, such as corporate governance quality, risk management maturity, or macroeconomic factors. Including these variables may help explain differences in banking performance more clearly. For policymakers and regulators, especially Otoritas Jasa Keuangan (OJK), it is recommended to design integrated digital transformation policies. These policies should focus on

strengthening digital infrastructure, improving banking human resources, and creating regulations that support efficiency and financial stability. Attention should be given not only to large banks but also to medium and regional banks to ensure balanced and sustainable banking intermediation in Indonesia.

Implications

The findings of this study have several important implications. First, the results show that the impact of CAR and bank size on intermediation depends on organizational context. This means capital strength and asset size alone are not always enough to improve lending performance. The effect depends on how these resources are managed within each bank structure. Second, digital transformation consistently improves intermediation in both BUMN and BPD banks. This implies that technology capability plays a direct role in increasing operational efficiency, improving risk management, and accelerating credit distribution. Therefore, banks that invest in digital systems are more likely to strengthen their intermediation function.

Third, the mediation results imply that capital and size become more effective when supported by digital capability, especially in BPD banks. This shows a cause-and-effect relationship: internal resources improve digital capacity, and digital capacity improves intermediation. However, in more stable and mature banks such as BUMN, the effect of digital mediation becomes weaker because their systems are already well established. Overall, the study implies that banking performance improvement should not focus only on increasing capital or asset size, but also on strengthening digital capability and internal organizational readiness.

Limitations

This study has several limitations. First, digital transformation is measured mainly using quantitative indicators related to operational efficiency. This approach does not fully capture qualitative aspects such as human resource readiness, IT governance quality, digital leadership, and implementation strategy. Therefore, the measurement of digital transformation may not fully represent the real digital capability of each bank. Second, this research only focuses on BUMN banks and BPD banks. Because of this limited sample, the results cannot be generalized to all banking categories in Indonesia, such as private national banks, Islamic banks, or foreign banks. Each bank type may have different organizational characteristics and digital readiness. Third, this study uses secondary data. Secondary data limits deeper understanding of internal managerial decisions, internal digital strategies, and policy considerations within each bank. As a result, some important qualitative dynamics may not be fully explained in this research.

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